COSMOS
Coherent Optical Sources using Micromolecular Ordered Structures

UNIVERSITY OF CAMBRIDGE

Liquid crystal laser arrays

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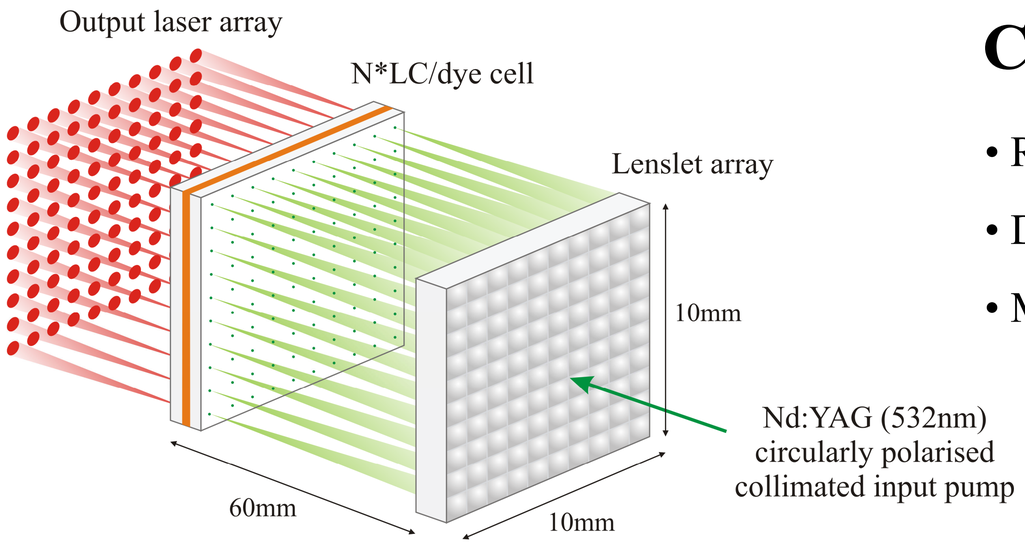
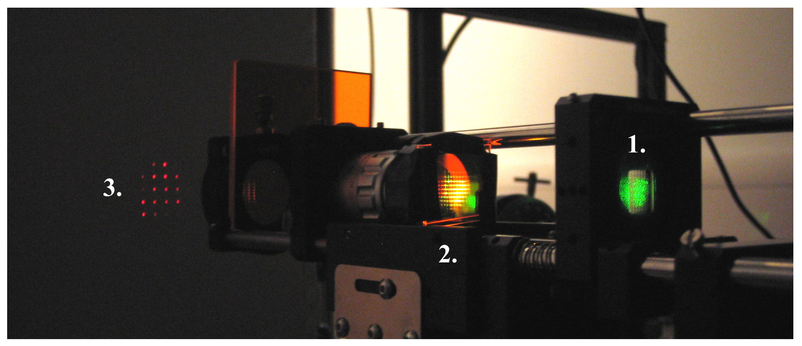
Concept of LC laser arrays

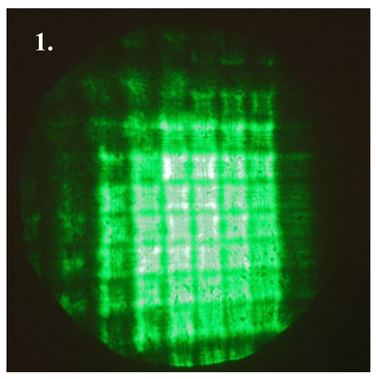


- Replace single focussing lens with lenslet array.
- Distribute pump beam across LC cell (better use of cell area).
- Multiple (recombinable) monomode LC laser sources.

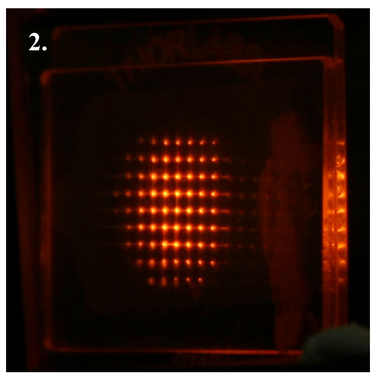


- Reduces optical reorientation & other effects caused by high pump intensity.
- Increases maximum throughput. High power organic lasers possible.

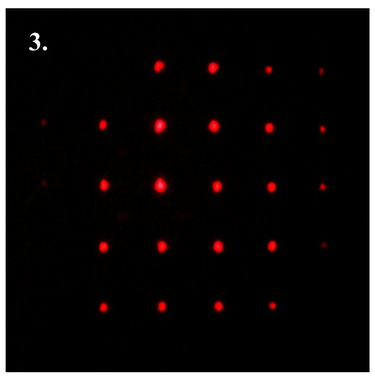
1. Pump beam incident upon lens array



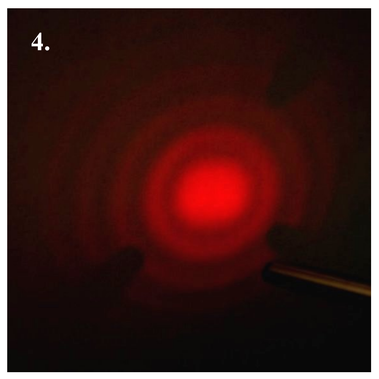
2. Focussed pump incident upon LC cell



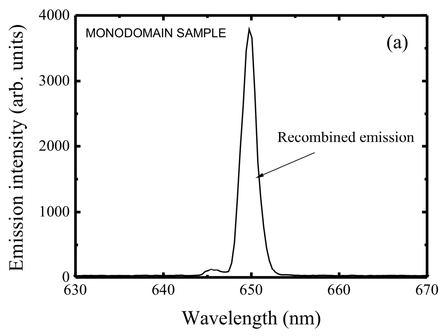
3. Output laser array



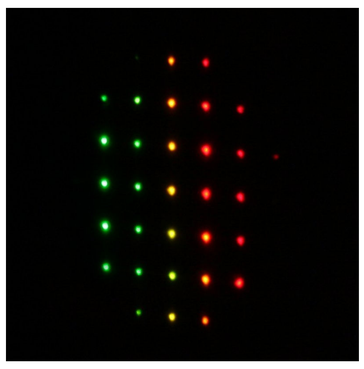
4. Recombined laser array



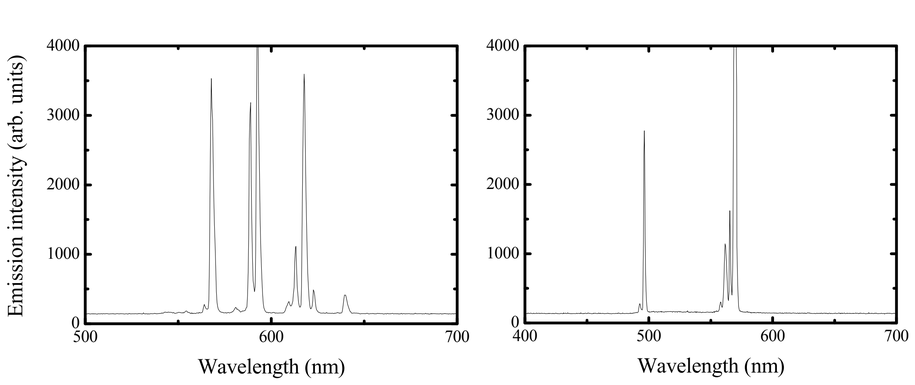
5. Recombined laser spectrum



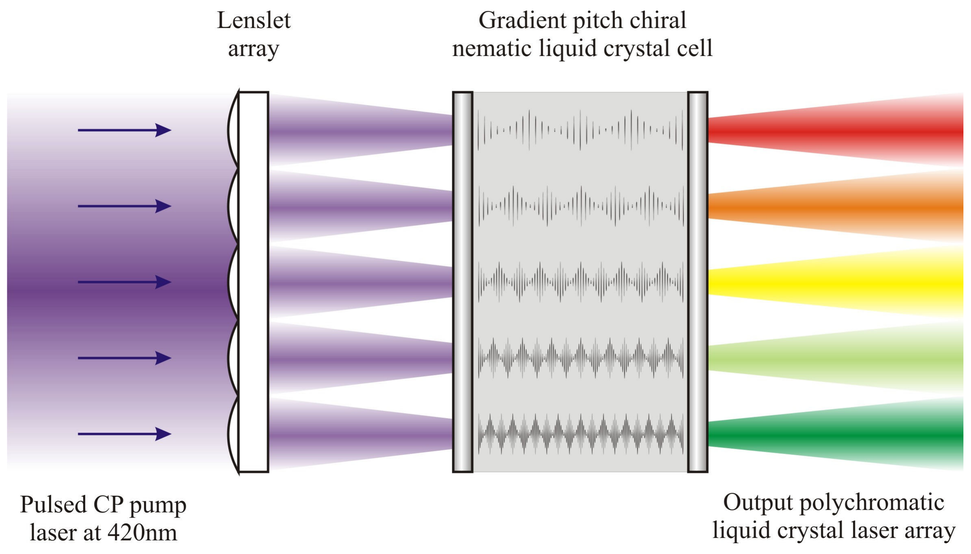
Polychromatic (gradient pitch) LC laser arrays



- Synthesise two LC/dye/chiral dopant mixtures, designed to lase at different wavelengths (ie: different chiral pitch).
- Fill cell with two mixtures from opposite sides, generating chiral pitch gradient across cell.
- Pump the gradient cell with a single (higher frequency) beam, illuminated by lenslet array.



(Left) Red/yellow/green gradient pitch laser array.
(Right) Green/blue dual band-edge lasing.



- Simultaneous multi-wavelength laser emission across array.
- Recombinable into single white light source.

Further reading: *P.J.W. Hands, S.M. Morris, H.J. Coles, T.D. Wilkinson*, Optics Letters, **33** (5), pp.515-517, (2008).
S.M. Morris, P.J.W. Hands, H.J. Coles, T.D. Wilkinson, Applied Physics Letters, (*in preparation*), (2008).

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COSMOS is a Basic Technology Research Grant funded by the EPSRC, EP/D04894X
Engineering and Physical Sciences Research Council EPSRC

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